PROPYLENE OXIDE, A REGISTERED FUMIGANT, A PROVEN INSECTICIDE

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Background (Morris Warren)

Propylene oxide (PPO) is a low boiling (94 deg F) liquid. It is in a class called "epoxides" because it has a shared oxygen atom that can react readily with many chemicals such as sulfur and amine compounds like DNA. It will react with OH groups when catalyzed with either an acid or base. For this reason it has wide applications in the manufacturing of glycols when PPO is reacted with water, food emulsifiers when reacted with fatty acids and to modify (make more water soluble) starches by reacting PPO with water dispersions of starch at pH 13 -14. Over 10 billion pounds of PPO are used annually to make propylene glycol, modified glycols for polyurethane foams, surfactants, emulsifiers and thousands of other products used by each of us daily.

Propylene oxide has been used for food "sterilization" since 1958 and is the only FDA/EPA authorized procedure allowed for reducing bacteria, mold and yeast in nutmeats and cocoa powder. Propylene oxide was also used as an insecticidal fumigant until 1988 when that registration was terminated.

Properties of propylene oxide

1) Description-Liquid at room temperature with boiling point at 94 deg F
2) Flammability-Flammable from 21%-36% by volume in air
3) Inhalation limits-OSHA 100 ppm 8 hr twa, EPA 20 ppm, PPO has a noticeable odor
4) Oral toxicity-converts to propylene glycol (GRAS) in low pH 2 of stomach
5) Eye and skin irritation-can burn eyes and irritate skin if not washed off promptly
6) California Prop 65 rates PPO as a carcinogen but not a teratogen

Sterilizing equipment and procedures for food sterilization

1) Basic equipment would be a vacuum chamber and volatilizer
2) Procedures: Product is loaded into a vacuum chamber, a vacuum to 26 " Hg is pulled, then volatilized PPO admitted. After 4 hours PPO is removed by many air washes.

Present FDA and U.S. EPA Regulations pertaining to propylene oxide

Propylene oxide for food fumigation is regulated by CFR 40 Part 185.515. It establishes a residue "tolerance" of 300 ppm for nutmeats, cocoa powder and spices. Fumigation exposure times are also regulated . ABERCO is actively supporting the reregistration of PPO under the new FQPA of 1996.

Insect fumigation tests (Tom Griffith)

Inhouse testing indicates that PPO has a 100% kill of Confused Flour Beetle adults, larvae and eggs at concentrations as low as 0.1 ounce of PPO per cubic foot of sterilizer space when used in vacuum chambers with 4 hour exposure at 80 F.

The results of tests underway to determine efficacy against the Indian Meal Moth and Warehouse Beetle will be reported at the MB Alternatives Conference.